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EFFECTS OF MODERATE PRESSURE OVERLOAD CARDIAC HYPERTROPHY ON THE DISTRIBUTION OF CREATINE KINASE ISOZYMES[1]

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Myocardial activities and isozyme distributions of creatine kinase (CK) and lactate dehydrogenase (LDH) were measured in rats with moderate pressure overload hypertrophy. Three weeks after aortic banding, the ratio of left ventricular (LV) weight to body weight increased by 30%. Values for enzyme activity in the hypertrophied LV were compared to values for control rats as well as to the contralateral relatively unaffected right ventricle (RV). In rats with moderate LV hypertrophy, total CK activity was unchanged. The percent MB-CK increased significantly ($p<0.01$) only in the hypertrophied LV, from 13 ± 1% to 19 ± 1% of total CK, while the sum of MM and mitochondrial-CK decreased from 86 ± 3 to 80 ± 3% ($p<0.01$). LDH activity increased ($p<0.05$) only in the hypertrophied ventricle from a control of 2.90 ± 0.13 to 3.21 ± 0.13 IU/mg protein, while the ratio of LDH activity at high to low substrate increased from 0.12 ± 0.02 to 0.14 ± 0.02 ($p<0.05$). Thus, the development of moderate pressure overload hypertrophy in the LV is associated with normal levels of total CK, but the percentage of MB-CK increases selectively in the primarily affected ventricle. Also, total LDH and LDH activity at high to low substrate concentration increases significantly in LV hypertrophy.

Myocardial hypertrophy is the major mechanism by which the heart compensates to a chronic pressure or volume overload. In order to perform the increased mechanical work, there must be commensurate changes in myocardial energy metabolism. Creatine kinase is particularly important because it is the catalyst for the reversible transfer of high energy phosphates between ATP and creatine phosphate: creatine phosphate + ADP ⇆ creatine + ATP. Thus, CK plays a pivotal role in energy transduction in the cell. While prior investigations have examined the extent to which hypertrophy alters levels of ATP, creatine phosphate (1), and isozymes of LDH (2,3), little attention has been paid to CK and the four CK isozymes BB, MB, MM and mitochondial-CK. The goal of the present investigation was to examine the effects of moderate pressure overload hypertrophy on the distribution of CK isozymes and to compare these effects with those on LDH isozymes. It is conceivable that in the presence of pressure overload hypertrophy an alteration in the total amount of CK or in the distribution of

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